

BLOOD GROUP CLASSIFICATIONS*

(A PLEA FOR UNIFORMITY)

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IN order to understand how the present chaotic situation of the classification of the blood groups has come about a brief review of some of the historical facts associated with blood grouping may not be amiss.

In 1900 Landsteiner¹ discovered that the blood serum of some individuals would agglutinate the red cells of others. At that time he was able to demonstrate three groups depending upon the manner in which this agglutination took place. Two years later a fourth group was identified by Decastello and Sturli.² Thus was established the existence of what has since come to be known as the four classical "blood groups". Although Landsteiner early pointed out that this division of the human family into four blood groups might have a very important significance both in respect to transfusion of blood and also in legal medicine, the discovery for some years attracted little attention.

In 1907 Jansky³ made the first definite classification of the blood groups numbering them I, II, III, and IV. Then in 1909 Moss,⁴ in America, quite independent of Jansky's work, devised a classification similar to that of Jansky except that groups I and IV were reversed. Although the work of Moss appeared two years later than that of Jansky, his classification became quite generally used both in America and Great Britain. Jansky's work, on the other hand, had been published in the Czech language and did not receive such wide or early publicity.

Shortly after the close of the World War, as blood transfusions became a more general therapeutic measure, it was soon realized that the use of two arbitrary numerical classifications in which the numbers did not agree was not without grave danger. Therefore, in 1920 a special committee was appointed to consider the problem and bring in recommendations for its solution. The committee represented the American Association of Immunologists, the Society of

American Bacteriologists, and the American Association of Pathologists and Bacteriologists. Because of the fact that Jansky's classification had been published approximately two years prior to that of Moss, his classification was selected on the basis of priority, and the recommendation that this classification be used was published in the *Journal of the American Medical Association* on January 8, 1921.

Although this selection at the time doubtless appeared to be the only fair thing to do the results have been most disappointing. While it is true that a number of institutions acting upon this recommendation did change from the Moss to the Jansky classifications, very little attention appears to have been paid by the great majority of hospitals to the recommendation of this committee. One reason for this may be, as Kennedy⁵ pointed out, that no survey had been made at the time to ascertain the extent to which the various hospitals throughout the country were using the two classifications. Such a survey carried out by Kennedy, some eight years afterward, revealed the fact that prior to 1921 90 per cent of hospitals doing groupings at that time, that is in 1920, were using the Moss classification and only 10 per cent the Jansky classification. On the basis of this survey he suggested that it would have been a much easier task for the minority to have changed to the classification employed at that time by the great majority, 90 per cent. To have done this, however, would have meant the failure to recognize Jansky's priority, a recognition which even after a lapse of over thirty years following his announcement he has still failed to obtain. Kennedy⁵ further pointed out in 1929 that by that date the great majority of hospitals doing groupings were still using the Moss classification (75 per cent), while there was a small increase in the use of the Jansky method and a few had adopted the "new" Landsteiner classification. Because the recommendation of the special committee in 1921 was having so little effect and the confusion still existed, the "new" Landsteiner classification was officially accepted

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by the National Research Council and the American Association of Immunologists in 1927⁶ and in the following year by the League of Nations.⁷ This at the time, no doubt, appeared to be a great step in advance, because its purpose was to do away once and for all with the two more or less arbitrary numerical classifications and replace them both with a single classification in which only capital letters are used. This classification is based on the generally accepted theory of Landsteiner of the presence of two agglutinable substances, A and B, in the red blood corpuscles. Thus, by reference to Table I, it is seen that the reason the

TABLE I.
AGGLUTINOGENS AND AGGLUTININS

Groups			Agglutinogens in cells	Agglutinins in serum
O	1 Jansky	4 Moss	....	ab
A	2 Jansky	2 Moss	A	b
B	3 Jansky	3 Moss	B	a
AB	4 Jansky	1 Moss	AB	....

Showing the agglutinin and agglutinin content of red blood cells and of serum respectively.

red blood cells of group I Jansky or group IV Moss are not agglutinable by any serum is that neither of the agglutinable substances (A or B) is contained in these particular red cells. The red cells, however, which do contain one or other or both of these agglutinogens, A or B, are agglutinable by their respective agglutinins in serum of another group. This classification, therefore, has a scientific basis, while the classifications of Moss and Jansky are merely arbitrary. A comparison of the three classifications is shown in Table II.

TABLE II.
COMPARISON OF CLASSIFICATIONS

International "new" Landsteiner	Jansky	Moss	Percentage
O	1	4	42
A	2	2	40
B	3	3	14
AB	4	1	4

Comparison of the three standard classifications of the blood groups; showing also the percentages of individuals in the various groups in a cosmopolitan area such as Toronto.

Although over ten years have now passed since this classification was accepted by the League of Nations it has not yet come into anything like general use, and the result is that we have now three classifications instead of two, all of which have their advocates. This situation of affairs was apparently anticipated by Kennedy⁵ when early in 1929 he wrote: "As to the recent agitation for a 'new' terminology, the so-called compromise system which it was hoped would eliminate both the Jansky and Moss classifications, there is no doubt that in this country, at least, the ultimate result of this agitation, if continued, will be three classifications. This, of course, is rather distressing and every manner of means should be exerted to prevent such a situation. . . . The pronounced opposition to the 'new' Landsteiner classification bids fair to make matters worse and it should be abandoned by the small number of institutions already employing it in one way or another."

Because of the fact that at that time the great majority of hospitals in Canada and the United States were still using the Moss classification as shown by Table III, Kennedy made a strong plea for its universal adoption and thus end once and for all the whole controversy by abiding by the will of the majority. This strong plea apparently has failed to attract any more attention than did the recommendation of the

TABLE III.
BLOOD GROUP CLASSIFICATIONS

	1920	1929	1938	1939
Author	Kennedy	Kennedy	Levine and Katzin	Erb
Number of hospitals...	363	552	331	53
Moss.....	percentage 68.6	percentage 71.0	percentage 58.0	percentage 39.9
Jansky.....	8.5	16.5	12.6	51.0
Jansky and Moss.....	....	2.9	1.1	1.8
International	....	4.7	11.1	3.7
International and Moss...	....	....	9.4	1.8
International and Jansky.	....	....	1.1	....
None.....	22.9	4.9	....	1.8

Results of surveys of Kennedy, of Levine and Katzin, and of Erb.

special committee in 1921 or the League of Nations' committee in 1928, and the situation as it exists at present is about as chaotic as it was twenty years ago. True, Levine and Katzin⁷ last year pointed out that a survey of 331 hospitals revealed an increase from 4.95 per cent using the International classification in 1928 to 11.14 per cent in 1938, and while they consider even this small increase in a ten-year period to be a "fortunate circumstance", it might be pointed out that at that rate of increase it will require practically 150 years until this classification is universally adopted.

Having been requested to discuss this situation at this convention and to make a plea for uniformity in classification, we decided first of all to make a survey of the hospitals in Ontario to determine the extent to which the various classifications are now in use. The results of

this survey are shown in Table IV. Altogether, 123 hospitals were circularized. Of these, only 53 replied but it should be pointed out that while these 53 hospitals represent only 43 per cent of the general hospitals in the province they comprise no less than 90 per cent of the general hospital beds. So that the figures may be considered for practical purposes as being quite representative.

By reference to Table IV it is seen that 21, or 39.9 per cent, of hospitals, representing 38.6 per cent of the beds, are using the Moss classification; that 27, or 51 per cent, of hospitals representing 52.4 per cent of the beds are using the Jansky classification; while only 2, or 3.7 per cent, of hospitals, representing 7.6 per cent of the beds, are using the International alone; one other hospital representing 185 beds is recording results in both the Moss and International classifications.

The geographical distribution of these hospitals is shown in Fig. 1. Thus it is seen that on the whole the groups of hospitals in the various larger centres conform to a certain classification. For example, in Ottawa the International classification is used; in Toronto the Jansky classification; and in Hamilton, London, and Windsor the Moss classification. In three small centres (Guelph, Peterborough, and Fort William and Port Arthur), more than one classification is still in use, and, while in all probability all these hospitals re-check all prospective donors, at the same time this situation must be more or less confusing. A goodly number of the replies indicated that the particular classifica-

tion used was chosen to conform to the classification used by the majority of hospitals in that community.

A comparison of these results with those published by Kennedy⁵ and by Levine and Katzin⁷ is not quite justifiable, first of all because of the small number of the hospitals comprising this group and, secondly, because it embraces quite a different territory. Nevertheless, it gives some indication of the situation in Ontario as compared with that in the United States and Canada as a whole and for this reason these figures are included in Table III.

TABLE IV.
RESULTS OF QUESTIONNAIRE SENT TO
123 HOSPITALS IN ONTARIO

		Percentage
Moss alone.....	21	39.9
Jansky alone.....	27	51.0
International alone.....	2	3.7
Moss with International.....	1	1.8
Cross agglutination only.....	1	1.8
More than 1 group.....	1	1.8
Total replies.....	53	

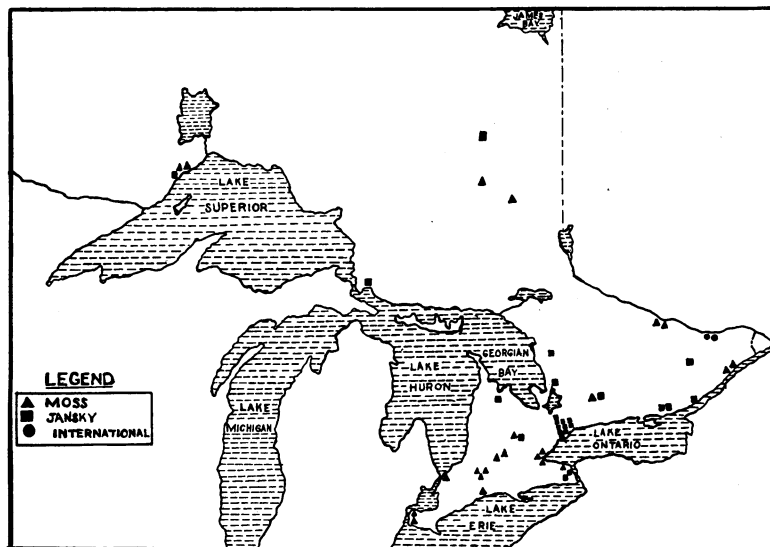


Fig. 1.—Geographical distribution of hospitals replying to the questionnaire and indicating classification used.

It is thus seen that here in Ontario at the present time Jansky's classification is in the lead (51.0 per cent) while relatively few hospitals are using the International. However, it should be pointed out that quite a number of the hospitals indicated their willingness to change to the International classification if by so doing uniformity would result.

To sum up, it might be said that each classification has something in its favour. For example, the Jansky classification was published first, and, therefore, on the basis of priority should receive first consideration. The Moss classification is still, throughout the country as a whole, most extensively used. The International classification has a scientific basis in contrast to the other two arbitrary classifications. This last, then, would seem the rational one to adopt, and in spite of the failures of the past and the many objections which have been raised, I believe that this could be done with very little inconvenience. While an abrupt change by all hospitals on a given date might seem ideal, such a change I do not believe to be practical. To make the change, however, would require the assistance of some organized body such as the Ontario Medical Association, working through the Canadian Medical Association, and the Canadian Hospital Association; also the co-operation of all the universities where blood grouping is taught; and most of all the co-operation of all the individual hospitals in which blood grouping is done.

With the co-operation of such organizations as just indicated, the next step would be for the various hospitals to report their groupings according to the International classification, but continue to use also in brackets the classification to which they have been accustomed for the past

TABLE V.
SUGGESTED METHOD OF REPORTING RESULTS

Patient.....	John Doe	Group O	(4 Moss)
Donor.....	James Buck	Group O	(4 Moss)
Patient.....	June Grey	Group AB	(4 Jansky)
Donor.....	May White	Group AB	(4 Jansky)
Patient.....	Otto Short	Group B	(3 Jansky)
Donor.....	Karl Long	Group B	(3 Jansky)

years. The manner in which this could be done is indicated in Table V. In this way, over a period of years, the various people concerned with transfusions should become perfectly familiar with the International classification and its relation to the other groups, so that the

change could be effected without the disruption of any hospital service.

With the outbreak of the war since the above paper was written, another strong argument for a unified system of recording blood groupings may be put forward. With the movement of troops from all corners of the globe the desirability of a uniform system is most obvious. I think that every endeavour should be made to bring about such uniformity by the introduction of the International system.

Also, may I again point out that, strictly speaking, there is no such thing as a "universal donor". While it is true that many small to medium-sized transfusions have been successfully carried out from a donor of Group O to a patient of another group, this procedure is not without danger, particularly when the transfusion is quite large. Having witnessed two fatalities, with severe hæmoglobinuria following this procedure, I feel very keenly that when transfusions are required among the troops, such transfusions should be only from donors in the same group, unless an emergency arises in which only a Group O donor is available. This contingency, I think, could pretty well be avoided if all men in service were to be grouped shortly after enlistment. To avoid confusion the result should be recorded according to the International method, followed, in brackets, by either the Jansky or Moss classification, preferably the former. If this method were adopted the necessity of calling upon the so-called "universal donor" should be reduced to a minimum.

TABLE VI.
KEY TO READING TESTS

Cells belong to group			Known serum	
			2 or A	3 or B
O	1 Jansky	4 Moss	—	—
A	2 Jansky	2 Moss	—	+
B	3 Jansky	3 Moss	+	—
AB	4 Jansky	1 Moss	+	+

+ sign indicates agglutination
— sign indicates no agglutination.

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